

# Wind tunnel AER stats

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Get wind tunnel data only.

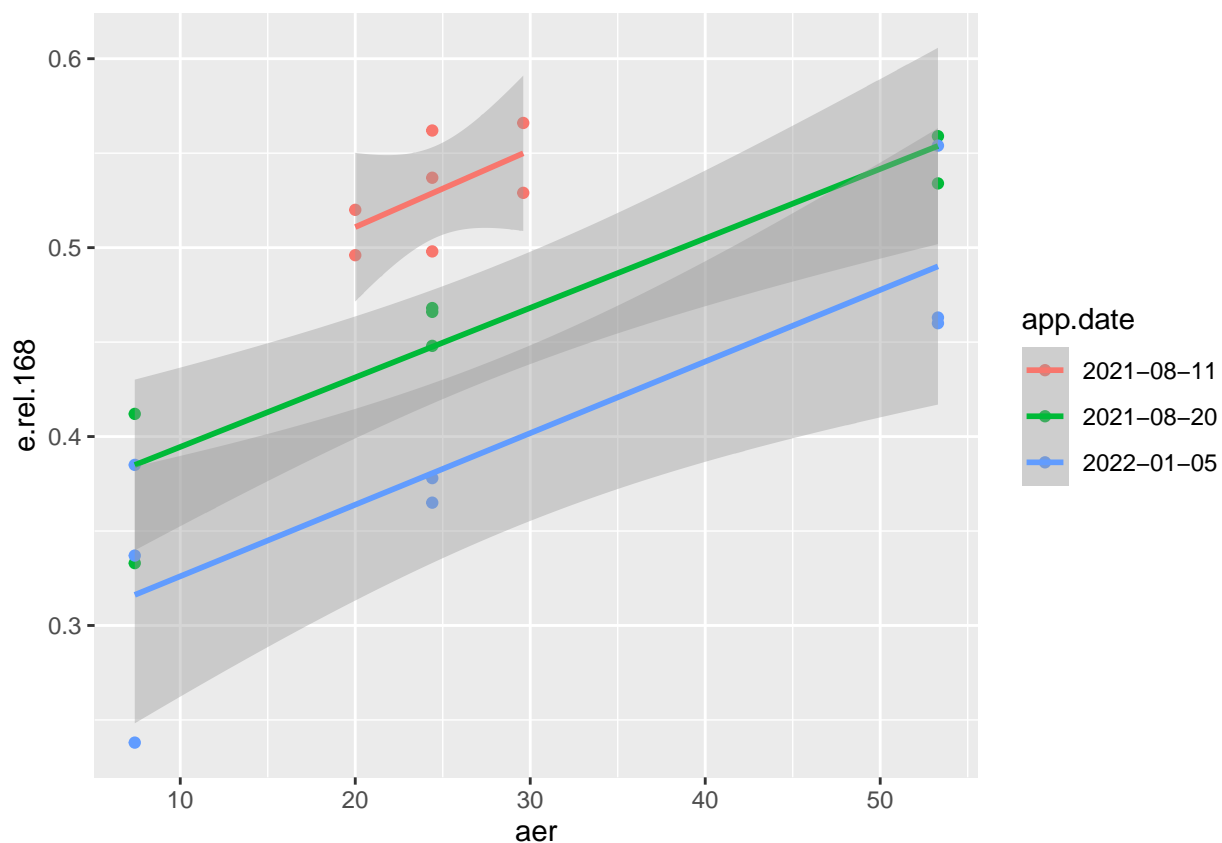
```
wsumm <- subset(isumm, meas.tech == 'Wind tunnel')
dfsumm(as.data.frame(wsumm))
```

```
##
## 22 rows and 23 columns
## 22 unique rows
##
##      trial.nm  app.date  pmid  meas.tech meas.tech2  aer
## Class      character character integer  character  character numeric
## Minimum      A 11 Aug 2021-08-11    1904 Wind tunnel      wt      7.4
## Maximum      C 05 Jan 2022-01-05    1925 Wind tunnel      wt     53.3
## Mean          <NA>      <NA>    <NA>      <NA>      <NA>     27.2
## Unique (excl. NA)      3      3      22      1      1      5
## Missing values      0      0      0      0      0      0
## Sorted          TRUE      TRUE      TRUE      TRUE      TRUE     FALSE
##
##      aer.grp      cta air.temp.mean air.temp.min
## Class      factor numeric      numeric      numeric
## Minimum      Low 7 or 20    181      2.46      -3.4
## Maximum      High 30 or 54   211     15.4     11.4
## Mean          Medium 25     193     10.5     4.93
## Unique (excl. NA)      3      3      6      6
## Missing values      0      0      0      0
## Sorted          FALSE     FALSE     FALSE     FALSE
##
##      air.temp.max wind.2m.mean wind.2m.min wind.2m.max rain.cum
## Class      numeric      numeric      numeric      numeric      numeric
## Minimum      8.5      0.1      0.1      0.1      0
## Maximum      22.3     0.72     0.72     0.72     0
## Mean          17.1     0.367     0.367     0.367     0
## Unique (excl. NA)      6      5      5      5      1
## Missing values      0      0      0      0      0
## Sorted          FALSE     FALSE     FALSE     FALSE     TRUE
##
##      rain.cum.48 j.NH3.mean j.NH3.min j.NH3.max e.cum.final
## Class      numeric      numeric      numeric      numeric      numeric
## Minimum      0      0.0763      0      0.431     16.1
## Maximum      0      0.218     0.0309     3.54     39.4
## Mean          0      0.165     0.0105     2.2     31.4
## Unique (excl. NA)      1      20      19      22     22
## Missing values      0      0      0      0      0
## Sorted          TRUE     FALSE     FALSE     FALSE     FALSE
```

```
##
##           e.rel.final e.cum.168 e.rel.168
## Class           numeric      numeric      numeric
## Minimum           0.261         14.7         0.238
## Maximum           0.585         39.2         0.566
## Mean              0.472         30.7         0.459
## Unique (excl. NA)      22          21          22
## Missing values         0           0           0
## Sorted             FALSE        FALSE        FALSE
##
```

```
ggplot(wsumm, aes(aer, e.rel.168, colour = app.date)) +
  geom_point() + geom_smooth(method = lm)
```

```
## `geom_smooth()` using formula 'y ~ x'
```



```
m1 <- lm(e.rel.168 ~ aer + factor(app.date), data = wsumm)
summary(m1)
```

```
##
## Call:
## lm(formula = e.rel.168 ~ aer + factor(app.date), data = wsumm)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.079013 -0.021060  0.002061  0.019678  0.067987
##
## Coefficients:
```

```
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.4373544  0.0187755  23.294 6.83e-15 ***
## aer              0.0037501  0.0005039   7.442 6.75e-07 ***
## factor(app.date)2021-08-20 -0.0816075  0.0199897  -4.082 0.000699 ***
## factor(app.date)2022-01-05 -0.1480920  0.0194106  -7.629 4.78e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03728 on 18 degrees of freedom
## Multiple R-squared:  0.8504, Adjusted R-squared:  0.8255
## F-statistic: 34.12 on 3 and 18 DF,  p-value: 1.227e-07
```

```
anova(m1)
```

```
## Analysis of Variance Table
##
## Response: e.rel.168
##              Df    Sum Sq Mean Sq F value    Pr(>F)
## aer              1 0.061325  0.061325  44.130 3.103e-06 ***
## factor(app.date)  2 0.080911  0.040456  29.113 2.283e-06 ***
## Residuals        18 0.025013  0.001390
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
confint(m1)
```

```
##               2.5 %      97.5 %
## (Intercept)      0.397908439  0.476800373
## aer              0.002691501  0.004808721
## factor(app.date)2021-08-20 -0.123604359 -0.039610631
## factor(app.date)2022-01-05 -0.188872193 -0.107311784
```

```
drop1(m1, test = 'F')
```

```
## Single term deletions
##
## Model:
## e.rel.168 ~ aer + factor(app.date)
##              Df Sum of Sq    RSS    AIC F value    Pr(>F)
## <none>                0.025013 -141.15
## aer                  1  0.076972 0.101985 -112.23  55.391 6.749e-07 ***
## factor(app.date)     2  0.080911 0.105925 -113.39  29.113 2.283e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
m2 <- lm(e.rel.168 ~ aer * factor(app.date), data = wsumm)
summary(m2)
```

```
##
## Call:
## lm(formula = e.rel.168 ~ aer * factor(app.date), data = wsumm)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.078183 -0.020660  0.002845  0.020009  0.068817
##
## Coefficients:
```

```
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.4295161  0.1023309   4.197 0.000682 ***
## aer              0.0040684  0.0041105   0.990 0.337024
## factor(app.date)2021-08-20 -0.0717983  0.1060734  -0.677 0.508155
## factor(app.date)2022-01-05 -0.1413697  0.1052222  -1.344 0.197845
## aer:factor(app.date)2021-08-20 -0.0003892  0.0041972  -0.093 0.927278
## aer:factor(app.date)2022-01-05 -0.0002796  0.0041692  -0.067 0.947363
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03952 on 16 degrees of freedom
## Multiple R-squared:  0.8506, Adjusted R-squared:  0.8039
## F-statistic: 18.22 on 5 and 16 DF,  p-value: 4.24e-06
```

```
anova(m2)
```

```
## Analysis of Variance Table
##
## Response: e.rel.168
##               Df    Sum Sq Mean Sq F value    Pr(>F)
## aer              1  0.061325  0.061325   39.266 1.125e-05 ***
## factor(app.date)  2  0.080911  0.040456   25.904 9.610e-06 ***
## aer:factor(app.date)  2  0.000025  0.000013    0.008    0.992
## Residuals       16  0.024988  0.001562
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
confint(m2)
```

```
##               2.5 %      97.5 %
## (Intercept)      0.212584357  0.646447790
## aer              -0.004645421  0.012782167
## factor(app.date)2021-08-20 -0.296663881  0.153067343
## factor(app.date)2022-01-05 -0.364430710  0.081691378
## aer:factor(app.date)2021-08-20 -0.009286814  0.008508499
## aer:factor(app.date)2022-01-05 -0.009117831  0.008558640
```

```
drop1(m2, test = 'F')
```

```
## Single term deletions
##
## Model:
## e.rel.168 ~ aer * factor(app.date)
##               Df Sum of Sq    RSS    AIC F value Pr(>F)
## <none>                0.024988 -137.17
## aer:factor(app.date)  2 2.5061e-05 0.025013 -141.15    0.008    0.992
```